



NASA XML Business Case

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Prepared by: Robert Benedict
HQ/Code AO

TABLE OF CONTENTS

<u>I.</u>	<u>Introduction</u>	4
<u>I.1</u>	<u>Background</u>	4
<u>I.2</u>	<u>Global Assumptions</u>	5
<u>II.</u>	<u>Case for Change</u>	6
<u>II.1</u>	<u>External Factors</u>	6
<u>II.2</u>	<u>As-is Condition/Internal Factors</u>	7
<u>III.</u>	<u>Benefit Analysis</u>	9
<u>III.1</u>	<u>Description of Benefits</u>	9
<u>III.2</u>	<u>Benefit Delivery Plan</u>	10
<u>III.3</u>	<u>Performance Measures</u>	13
<u>IV.</u>	<u>Risk Analysis</u>	14
<u>IV.1</u>	<u>Types of Risk</u>	14
<u>IV.2</u>	<u>Risk Factors and Comparison</u>	14
<u>V.</u>	<u>Recommendation</u>	26

NASA XML Business Case

I. Introduction

NASA is primarily an information-centric agency. The end result of virtually all the activities that NASA performs in support of its missions is information that is shared with the American public, with our university and private industry partners, and with the international community. In order to be most successful, NASA must use management approaches, processes, and technologies that allow us to generate, transmit, and utilize information effectively and efficiently. This business case details why NASA should invest in a set of activities that will advance Agency-wide the appropriate use of a key information handling technology known as the eXtensible Markup Language (XML). The activities described in this business plan will assist the Agency in developing, and will be fully coordinated with the ongoing effort to define, the NASA Enterprise Architecture. The NASA XML Project Plan will describe how the activities proposed in this business case will be implemented.

I.1 *Background*

Government, industry, and academia are all embracing XML as a technology that will assist in the sharing and reuse of information. Virtually all major software vendors including IBM, Microsoft, Sun, SAP, Oracle, and Software AG have made XML important parts of their product offerings. XML has been so widely adopted because it is an open standard and is relatively simple to learn and use. It provides a self-describing way of labeling both text and data. XML allows information content to be processed with very little human involvement and exchanged across diverse computer hardware, operating systems, and applications. These capabilities are extremely valuable to an organization like NASA that has diverse missions, works with many external partners, and by necessity must use computer hardware and software supplied by many different vendors. The value of XML will continue to grow as Web Services become an increasingly important tool for conducting business.

Section II of this document provides additional information on the external and internal factors that compel NASA to use XML. The web site operated by the General Services Administration (GSA) for the Federal XML Working Group at <http://www.xml.gov> provides additional background information on XML, especially XML initiatives in the Federal government.

I.2 *Global Assumptions*

Following are the global assumptions made for this business case:

- XML will continue to be an important open standard supported under the auspices of the World Wide Web Consortium (W3C), the Organization for the Advancement of Structured Information Standards (OASIS), and other major open standards organizations.
- XML will continue to be supported in vendor products that are important to NASA.
- The Federal Enterprise Architecture will continue to include XML as a key technology component.
- NASA Communities of Interest (CoI) will become increasingly active in their use of XML for application development and integration, which underscores the importance of formulating Agency-wide policy and establishing mechanisms for sharing resources.

II. Case for Change

Factors both external and internal to the Agency drive the requirement for advancing the use of XML within NASA. The external factors relate to Federal-level changes mandated by the Office of Management and Budget (OMB) and to the increasing use of XML by our partners and by Information Technology (IT) vendors' products. XML is directly responsive to the President's Management Agenda mandate to better share information among government bodies at all levels. Internal factors reflect the need to be more efficient and effective in the way that NASA manages its information. The following sections describe the external and internal factors.

II.1 External Factors

The Federal government, due to its size and diversity of business and technological solutions, often has great difficulty sharing information electronically among its departments and agencies, and with the states, industry, academia, and the public. Moreover, the various Federal departments and agencies often redundantly define and have trouble defining common vocabularies for apparently simple concepts, such as addresses, resulting in wasted time and effort. To answer this need, organizations like OASIS have created specific XML vocabularies (for example, the Extensible Address Language). Unless such a vocabulary is accepted and shared among institutions and Federal agencies, exchanging address information is difficult and error-prone. XML clearly provides a useful framework for resolving these types of issues. The Federal government and private industry are moving aggressively to adopt XML as a keystone technology:

- The E-Gov Act of 2002 calls out XML specifically as an area requiring Federal guidelines and standards. The legislation recognizes the importance of XML in IT, and seeks to ensure that the Federal government takes full advantage of its possibilities for improving effectiveness and efficiency.
- OMB requires agencies filing Exhibits 300 as part of the budget process to use the XML format unless they use the OMB-designated system for filing.
- XML has been designated as a key standard in the emerging Federal Enterprise Architecture (specifically in the Data Reference Model and the Technical Reference Model). This decision is significant because the Enterprise Architecture of every Federal agency must align with the Federal Enterprise Architecture. As a result, XML will be the primary information interchange standard among Federal agencies. NASA will be required to use XML in the future when it must exchange information with other Federal agencies.
- To assist the Federal government in moving to XML and fully utilizing its capabilities, the Federal CIO Council (co-chaired by a senior OMB official) sponsors the Federal

XML Working Group and the (XML-based) Web Services Working Group. These Working Groups are developing pilots and other initiatives with the participation of many Federal agencies that will likely lead to production systems which NASA will want or need to use.

- The Department of Defense (DOD) Defense Information Systems Agency (DISA) has developed and managed an XML Registry that serves all of DOD.
- Many Federal agencies have put into production and/or embarked on agency-specific IT initiatives that rely heavily on XML.
- Within the IT industry, vendor products used by NASA are incorporating XML as a key enabling technology. For example, the Microsoft .Net product suite for Web services depends upon XML; the competing products from Sun and other vendors based on Java 2 Enterprise Edition (J2EE) also rely on XML. Even more significantly for NASA, SAP has announced that its future Enterprise Resource Planning products will utilize XML. Therefore, we can expect future SAP products that support the Integrated Financial Management Program (IFMP) to incorporate XML. Industry's use of XML and XML-based standards such as Simple Object Access Protocol (SOAP) and Web Services Definition Language (WSDL) to power their products will greatly assist government in linking disparate information systems.

II.2 *As-is Condition/Internal Factors*

NASA as an Agency faces the same problems of sharing data and re-inventing information vocabularies as the rest of the Federal government. While individual programs and projects within the Agency manage their information well and communicate with external partners, information is often stove piped within those programs and projects. Re-using in one initiative the information defined in another initiative is often difficult. The internal factors driving NASA to better utilize XML within the Agency stem both from limited Agency coordination for existing XML efforts and the need to promote the use of XML where it is not in use today:

- NASA has strong pockets of XML expertise and usage, e.g., the Code U Web home page utilizes XML to reuse with minimal effort the information it displays for press releases and other purposes. Similarly, programs/projects/initiatives at many Centers, including GSFC, JSC, LaRC, and JPL use XML. NASA Centers benefit from staff who have gained experience with their XML implementations and may justifiably be called XML experts. The OneNASA portal, which will be the primary gateway to NASA's Web-based resources, will rely heavily on XML as the format-of-choice for its content management system.
- However, there is limited Agency-wide communication among the various NASA XML communities. The NASA XML Working Group first met in March 2003 and is still very much in its formative stage. As a result, there are limited opportunities across specialty areas within the Agency for dissemination and reuse of data, sharing of best practices and lessons learned, common usage of tools and approaches, and similar benefits.

- Despite the excellent work occurring at many of our Centers and the recent inauguration of the NASA XML Working Group, there is little information across the Agency about the identity of XML practitioners and their initiatives, including the various ways they may be using XML, the problems they are encountering, the assistance that they may need in being more productive, etc. Consequently, NASA is participating in activities at the Federal level and with standards organizations in reviewing policies and standards initiatives that will affect its future usage of XML without a strategic foundation of knowledge about the various XML implementations already underway. These policies and standards will become increasingly important to NASA since OMB is now insistent on standard approaches within the Federal government to information sharing and reuse both within and among agencies.
- There are initiatives underway within NASA that could benefit from the use of XML but are not, due to lack of understanding of these benefits or a concern about the upfront investment required. The result is that NASA continues to lag behind other agencies in the adoption of XML and may have to modify systems that it is currently building in order to comply with OMB guidelines.

III. Benefit Analysis

III.1 *Description of Benefits*

Since only limited data on the use of XML in the Agency is available, it is not possible to quantify the benefits associated with the activities described in this business plan. However, clearly the Agency will realize substantial cost avoidance benefits as well as qualitative benefits by approving this investment. The benefits of approving the investments described in this business plan include:

- Cost avoidance by the Agency in using existing and/or planned Federal XML registries rather than developing its own. The DISA XML Registry NASA uses cost DOD millions of dollars; the planning and acquisition costs of the XML.gov Registry/Repository has been estimated at over \$3M (Source: XML.gov Registry/Repository Business Case: <http://www.xml.gov/documents/completed/bah/registryBusinessCase.htm>). NASA is now using the DISA XML Registry under an agreement with the Department of Defense. As NASA gains additional experience in its use, the Agency will decide whether or not to continue using the DISA XML Registry depending upon how well it meets the Agency's requirements, including those for security, as they evolve. Whether NASA continues to use the DISA Registry or moves to a new Federal CIO Council registry, investing in a common registry is far cheaper than building our own. If the use of a common registry is in the end deemed to be impractical, a separate business case will be developed to justify the implementation of a NASA-specific registry. **(BEN01)**.
- Cost avoidance by Agency initiatives that will reuse XML vocabularies, schemas, and other information contained in the NASA XML Registry. Agency mission, engineering, and administrative applications will all benefit from the XML vocabularies, schemas, and other pertinent information stored in the XML Registry **(BEN02)**.
- Cost avoidance by Agency initiatives that adopt XML or expand their use of XML and benefit from lessons learned from the NASA XML Working Group **(BEN03)**.
- Cost avoidance by eliminating unnecessary and duplicative testing and integration of XML-related products by individual Centers and initiatives that could be performed by a centralized testing and integration capability **(BEN04)**.
- More consistent application of security and privacy policies through clearer definition and labeling of information to which those policies apply **(BEN05)**.
- Improved interoperability between Agency software systems that use XML natively or via gateways, resulting in both cost avoidance and better support for Agency initiatives **(BEN06)**.
- Improved interoperability and information sharing among NASA, other Federal agencies, and our industry and academic partners **(BEN07)**.

- Faster time to publish and consequently better service to the public via easy reuse of NASA's information targeted for dissemination on publicly available web sites (**BEN08**).
- Compliance with the Federal Enterprise Architecture as mandated by OMB (**BEN09**).
- Demonstrable support for the President's Management Agenda mandate to improve the interoperability of information systems (**BEN10**).

III.2 *Benefit Delivery Plan*

Table 1 on the next page summarizes the expected timeframes for delivery of the benefits described in the previous section. The benefits levels are characterized in a qualitative way as High (H), Medium (M), or Low (L) for fiscal years FY 2004 through FY 2008. Each level is in reference to the full benefit that can eventually be expected as a result of implementation of the proposed investments. For example, a cost avoidance benefit characterized as low in a particular fiscal year means that, in that fiscal year, only a low percentage of the full benefit will be realized. The Comment field provides a summary explanation of the trend of benefit delivery.

Table 1: Benefit Delivery by Fiscal Year

Benefit ID	Benefit Summary	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	Comment
BEN01	Cost avoidance from using another agency's XML registry	H	H	M	M	M	If NASA used its own registry, the Agency would incur high costs in FY 2004 and FY 2005 during development and initial implementation; value of cost avoidance decreases in FY 2006 through FY 2008 but is still present at a medium level due to savings of operational costs.
BEN02	Cost avoidance from reusing XML information contained in XML registry	L	M	H	H	H	Savings associated with registry use will increase as more information is stored in the registry and as more applications are developed.
BEN03	Cost avoidance by Agency initiatives that adopt/expand use of XML and benefit from XML Working Group	L	M	H	H	H	Cost avoidance will increase with increased use of XML and accumulating lessons learned shared by XML Working Group.
BEN04	Cost avoidance by centralized testing and integration capability			L	H	H	Centralized capability will be stood up in FY 2005. Benefits will quickly accrue once capability is present.
BEN05	More consistent application of security and privacy policies	L	M	H	H	H	As more information becomes available in the XML Registry, and as the security improves, this benefit will also increase.

Table 1: Benefit Delivery by Fiscal Year (contd.)

Benefit ID	Benefit Summary	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	Comment
BEN06	Improved interoperability between Agency systems	L	M	H	H	H	As more information is tagged and XML artifacts are available in the XML Registry, this benefit will also increase.
BEN07	Improved interoperability and information sharing between NASA and external systems	M	H	H	H	H	Due to rapid increase in the use of XML in other agencies and the reliance of XML in e-Gov initiatives, this benefit will accrue more rapidly than for intra-NASA systems.
BEN08	Faster time to publish and better service to the public for information on NASA's publicly available web sites	H	H	H	H	H	Work is progressing rapidly on using XML within NASA for publication to the OneNASA external portal.
BEN09	Compliance with the Federal Enterprise Architecture as mandated by OMB	H	H	H	H	H	Making the commitments proposed in this business case along with including XML as a key component in the NASA Enterprise Architecture demonstrates compliance.
BEN10	Demonstrable support for the President's Management Agenda	H	H	H	H	H	Making the commitments proposed in this business case along with including XML as a key component in the NASA Enterprise Architecture demonstrates support.

III.3 *Performance Measures*

The following performance measures will be tracked to ensure effectiveness of the investments proposed in this business case:

- Number of submissions to the NASA XML Registry
- Number of communities of interest submitting artifacts to the NASA XML Registry
- Number of subscriptions to artifacts in the NASA XML Registry (indicating usage of the artifacts)
- Number of inquiries to the NASA XML Registry
- Number of individuals participating in the NASA XML Working Group
- Customer satisfaction surveys conducted to determine degree to which user community is satisfied with XML support at Agency level
- Number of visitors to the NASA XML Working Group Web site (proposed)
- Number of XML-based applications implemented by members of the XML Working Group (will be tracked on Web site).

In addition, the Office of the Chief Information Officer will utilize existing governance bodies to provide feedback and suggestions for improvements.

IV. Risk Analysis

IV.1 *Types of Risk*

This section identifies four categories of risk associated with this investment decision:

- Risks related to recommended investments in an XML Registry
- Risks related to the use of or failure to use XML within the NASA IT infrastructure
- Risks related to XML as a technology
- Risks related to the scope of the activities included in this business case.

The analysis that follows describes individual risks within each category.

IV.2 *Risk Factors and Comparison*

Table 3 below analyzes the risks associated with the activities proposed for this investment as follows:

- The risk is described
- The probability of the risk occurring (without mitigating actions) is characterized as high, medium, or low
- The severity of impact (without mitigating actions) that would occur if the risk is realized is characterized as high, medium, or low
- The importance of the risk (without mitigating actions) is characterized by factoring in the probability of the risk occurring and the severity of the impact if the risk is realized
- Mitigating actions that are planned to reduce the probability of the risk occurring and/or to minimize its impact if the risk is realized are described
- The residual importance of the risk after mitigating actions is characterized as high, medium, or low.

Table 3: Risk Analysis

Risk	Probability	Impact	Importance	Mitigation	Residual Importance
Risks related to recommended investments in an XML Registry					
NASA may not be able to continue using the DISA Registry because it is not adequate for our needs. Initial experience with the registry indicates it may have shortcomings	M	H	H	<ul style="list-style-type: none"> • DISA will train NASA on the use of the registry so that we fully understand its capabilities • DOD has levied the requirement on its XML developers to use the registry and we can expect that registry shortcomings will be addressed to meet DOD (and thereby) NASA needs • NASA participates in the DISA Registry governance process and so can influence needed registry changes • Individual users of the DISA Registry are invited to submit feedback. All suggestions are logged into a database and are reviewed at the beginning of each development cycle. • This plan budgets funds for enhancement of the DISA Registry to meets our needs. 	M

Risk	Probability	Impact	Importance	Mitigation	Residual Importance
				<ul style="list-style-type: none"> • The NASA XML Project Plan will include discrete milestones for formally reviewing the Registry's capabilities vs. NASA's requirements and determining whether NASA should continue to use the DISA Registry or follow a different approach. • If all else fails, NASA can move its XML data to the Federal CIO Council registry now under development and will still benefit from the experience gained using the DISA Registry 	

Risk	Probability	Impact	Importance	Mitigation	Residual Importance
NASA may not be able to continue using the DISA Registry because DOD closes its use to non-DOD organizations. This could occur either due to security or other policy considerations	L	H	M	<ul style="list-style-type: none"> NASA will continue to participate in the DISA Registry governance process and so we expect to have early warning of such a policy change, along with time to migrate to another registry. NASA can move its XML data to the Federal CIO Council registry now under development and will still benefit from the experience gained using the DISA Registry This plan budgets funding for upgrades to the DISA Registry which we would shift to another registry if unable to use the DISA Registry. 	L

Risk	Probability	Impact	Importance	Mitigation	Residual Importance
NASA may not be able to continue using the DISA Registry because OMB requires civil agencies to use CIO Council registry	L	H	M	<ul style="list-style-type: none"> NASA continues to work closely with the OMB Federal Enterprise Architecture Program Management Office and with the Federal CIO Council. We expect to receive early warning and time to transition our data to another registry if OMB made such a decision This plan budgets funding for upgrades to the DISA Registry which we would shift to another registry if unable to use the DISA Registry. 	L

Risk	Probability	Impact	Importance	Mitigation	Residual Importance
A significant percentage of NASA initiatives using XML may not contribute their XML data to the registry or utilize artifacts submitted by others. This may be due to perceived lack of value of the registry to the initiatives, issues with the registry's design/implementation, or lack of resources/time to populate the registry.	M	H	H	<ul style="list-style-type: none"> • DISA will train NASA on the use of the registry so that we fully understand its capabilities • Ensure that the registry meets NASA requirements by making necessary investments or migrating to another registry. • Ensure that NASA policies and procedures are responsive to the Agency XML communities' needs and are streamlined for efficiency • Provide contractor support to initiatives to provide further training and consulting assistance in using and populating the registry • Build a strong NASA XML Working Group of Agency practitioners that conveys the XML communities' needs to the Office of the CIO and the Agency's needs to the XML community. 	M

Risk	Probability	Impact	Importance	Mitigation	Residual Importance
Risks related to the use of or failure to use XML within the NASA IT infrastructure					
NASA initiatives not using XML as a native capability may refuse to use XML or be unable to interface with the Agency XML infrastructure due to resource, schedule, technical, or other considerations. The result would be lack of compliance with the President's Management Agenda, reduced Agency interoperability/stovepipe implementations, and unnecessary duplication of effort in defining and describing important Agency data.	H	H	H	<ul style="list-style-type: none"> • Educate the NASA community on the mandates included in the President's Management Agenda and in the FEA concerning interoperability and the use of XML • Put in place Agency policies regarding the use of XML consistent with Federal level mandates • Provide contractor consulting assistance in analyzing how to best interface with the Agency's XML infrastructure • Include initiatives in the NASA XML Working Group and in related governance activities so that their requirements and issues are understood and addressed • Establish a Web site that collects information about XML use within NASA, to help groups that are not 	H

Risk	Probability	Impact	Importance	Mitigation	Residual Importance
				<p>presently using XML to understand both the requirements and benefits of using XML, and to provide resources that would help them get started.</p> <ul style="list-style-type: none"> • Share via the Working Group best practices, vendor product evaluations, and technical approaches 	

Risk	Probability	Impact	Importance	Mitigation	Residual Importance
Agency XML efforts may not be consistent with the NASA Enterprise Architecture, leading to a mismatch between the Agency's business requirements for XML and its XML infrastructure which supports those requirements	L	H	M	<ul style="list-style-type: none"> Both the NASA Enterprise Architecture effort and the Agency XML efforts described in this document will be led by the Office of the CIO, and will be closely coupled The NASA XML Working Group will assist in defining the XML infrastructure portion of the NASA Enterprise Architecture under the direction of the Enterprise Chief Architect 	L

Risk	Probability	Impact	Importance	Mitigation	Residual Importance
Risks related to XML as a technology					
Security or other concerns may make use of XML problematic for NASA and the benefits anticipated from these Agency investments will not be realized.	M	H	M	<ul style="list-style-type: none"> NASA will participate in OASIS, other standards bodies, and Federal-level initiatives that are analyzing the technical risks associated with XML and are working to mitigate them NASA (along with the rest of the Federal Government) will make its XML-related requirements known to the vendor community so that acceptable commercial products are available XML is a key enabling technology for a broad spectrum of applications in business, scientific, and government arenas. Any security shortcomings discovered will likely be addressed vigorously. The NASA XML Working Group will share best practices and lessons learned 	M

Risk	Probability	Impact	Importance	Mitigation	Residual Importance
The Federal Enterprise Architecture may change in the short term and require a competing technology to XML and the benefits anticipated from these Agency investments will not be realized. The probability of this risk is rated very low due to the relative maturity of XML and the lack of competing technologies that can approach its capabilities.	L	H	L	<ul style="list-style-type: none"> • The NASA Office of the CIO will continue its strong involvement in the development of the Federal Enterprise Architecture and have early warning concerning any changes to the requirement to use XML • NASA will continue to participate in OASIS and promote standards that will augment the value of XML to NASA and to the Federal Government as a whole; this will also assist NASA in staying current with new technologies so that the Agency will be ready to adopt them should they eventually supplant XML 	L

Risk	Probability	Impact	Importance	Mitigation	Residual Importance
Risks related to the scope of the activities included in this business case.					
The scope of activities proposed for funding in this business plan is very large. Failure to adequately manage and execute these activities will result in wasted investment and opportunity loss associated with unrealized XML benefits for the Agency	M	H	H	<ul style="list-style-type: none"> Fully fund and support the proposed activities so that the resources needed for their accomplishment can be applied Apply oversight of the activities and work products via standard Office of the CIO governance and management processes to ensure their quality and timeliness. Provide yearly (or as needed) updates to this business case to reflect changes to external and internal business drivers. 	M

V. Recommendation

NASA should commit to XML as a strategic technology and make the investments recommended in this business case to ensure that the full benefits of XML are realized by the Agency. The Agency's XML efforts should be led by the NASA Office of the CIO to ensure implementation of XML capabilities that are consistent with both the NASA Enterprise Architecture and the Federal Enterprise Architecture. By taking these steps, NASA will improve the interoperability of its information systems and increase information reuse, thereby lowering costs and reducing the time needed to deliver new capabilities to its programs. NASA will also comply with the OMB requirement to align with the Federal Enterprise Architecture and will be directly responsive to the requirements of the President's Management Agenda.